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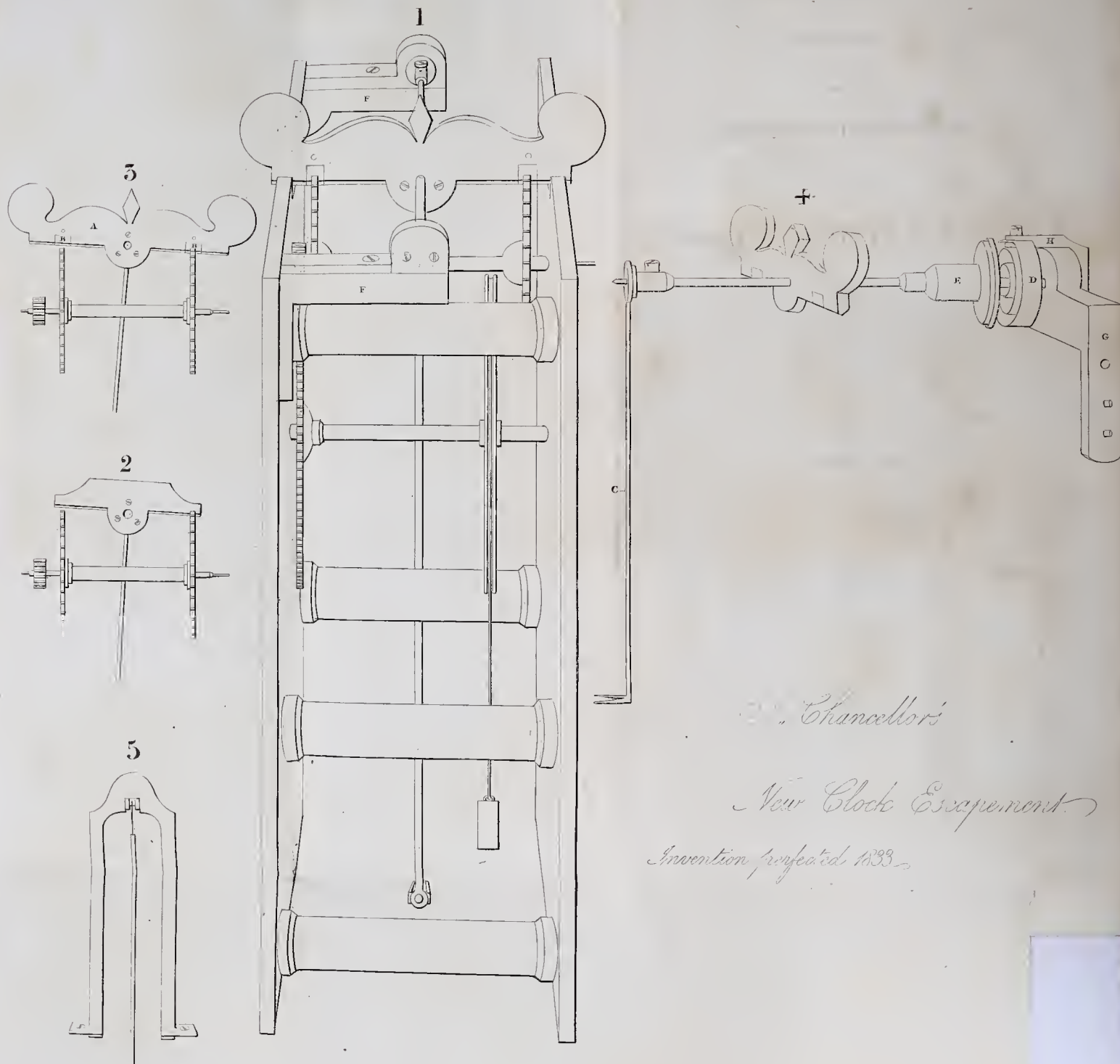
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Chancellor's

New Clock Escapement.

Invention perfected 1833



*Mr. Cumming*  
**A TREATISE,**

*The Marquis of Anglesea*  
*with the Author*  
*Humble Request*  
IN NINE SECTIONS,

ON THE

PROPERTIES AND ADVANTAGES

OF

A NEW INVENTED ESCAPEMENT,

WITH

REFERENCES TO ALL ITS PARTS

BY ENGRAVED DIAGRAMS.

DEDICATED, BY ROYAL PERMISSION, TO  
THE KING.

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BY JOHN CHANCELLOR.

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DUBLIN :

PRINTED FOR JOHN CUMMING,

16, LOWER ORMOND-QUAY.

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1833.





## DEDICATION.

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SIRE,

Emboldened by a sense of your Majesty's goodness, and by a conviction that no discovery in Science, in however humble an individual, will be considered altogether undeserving the King's protection, I approach your Majesty with the following Treatise.

It contains, in a few words, and in the simplest language, an improvement in “ *Horology*.”

The principle on which this discovery is founded is no longer a matter of speculation ; its practical results are now in action.

I have perfected it with years of labour, and I lay it with all humility at your Majesty's feet, in the full assurance that your Majesty's professional habits and education will render you more peculiarly alive to an improvement which

will be found materially conducive to the advancement of Navigation ; and in the earnest belief, also, that the Earl of Ulster will receive, with condescension and benignity, this humble tribute of respect, from one of his Majesty's most faithful and devoted Irish subjects.

JOHN CHANCELLOR.

*Dublin, March 8th, 1833.*



## INTRODUCTION.

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**M**ESSRS. CHANCELLOR AND SON have the honour of submitting to the Nobility, Gentry, and Gentlemen connected with Public Buildings, a small Treatise, in Nine Sections, in which the properties and advantages of their improvement in Horology are set forth and explained.

To a Turret Clock, now going in their Establishment, the Inventors can with confidence refer, as being equally calculated to protect themselves from misrepresentation, and to afford a practical illustration of the utility and intrinsic merits of their discovery.





# A TREATISE,

&c. &c.

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## SECTION I.

ON CIRCULAR MOTION AS CONNECTED WITH  
CLOCK-WORK.

**CIRCULAR MOTION** in the formation of Escape-ments, has hitherto been considered the only method of producing action and re-action for Horological Machinery.

For the improvement of Circular Escape-ments, numerous contrivances have been, at different periods, introduced ; but none to alter its principle.

It is nearly a century since Mr. George Graham invented his well-known Dead Beat, which, as a Circular Escapement, has been considered the most perfect ever discovered.

Mr. Vulliamy, Watch and Clock-maker to his Majesty, very recently contrived a most ingenious mode of finishing Circular Pallets in the lathe, which has gained him much celebrity ; but, notwithstanding its being brought

to the highest degree of perfection, it is still considered defective.

Captain Kater, who is so justly celebrated for his scientific attainments, and particularly for his knowledge of Horology, informed the author, in the course of a conversation with which he was honoured, that he never could be thoroughly reconciled to Circular Escapements.

To announce to the Public a New Invented Escapement, superior in principle and different in construction to any Escapement that has been made, would appear highly presumptuous, were not the inventor capable of proving, both in theory as well as practice, that his *Right Angle Escapement* possesses those advantages which none hitherto invented does; having, from its wonderful decrease of friction, effected an object sought after for upwards of a century, namely, the power of transmitting the propelling force equally through the train to the pendulum, with an avoidance of friction and percussion to an extent beyond what has been attained, or thought attainable in clock-work.

In Doctor Lardner's Cyclopædia, Captain Kater thus expresses himself on the subject of Escapements:

“ When Escapements are employed which  
 “ do not insure an unvarying impulse to the

“ pendulum, the force may be unequally trans-  
 “ mitted through the train to the clock, in  
 “ consequence of unavoidable imperfections of  
 “ workmanship, and the arc of vibration may  
 “ suffer increase or diminution from this cause.  
 “ To discover a remedy for this is certainly  
 “ most desirable.”

The author has felt such desire for years, and has acted on it in a long course of experimental operations.

From these has resulted the discovery of the Rectilinear Escapement, the principle and properties of which are now laid before the public.

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## SECTION II.

### ON THE MONTH TRAIN, AS APPLIED TO RIGHT ANGLE ESCAPEMENTS, AND ITS ADVANTAGES.

This Turret Clock has a square frame, three feet long, and eighteen inches wide, with a going and striking part. The train of the going or watch part is calculated to go a month ; and has a barrel twelve inches in diameter, three times the breadth usually given to Turret Clocks of the same size.

The multiplying wheel and pinion are con-



structed on a peculiar plan, to generate power without increasing friction.

The barrel of the going part being increased beyond the usual dimensions, requires forty-eight feet fall for the weight, but as it is to be wound up once a week, one-fourth is only necessary. The consequence is, that the diameter of the barrel being increased *three times*, three times less weight is necessary as a propeller; and as there is no power required in the Escapement to raise the crutch and pallets, (these being neutralized,) the friction of the extra wheel and pinion is hardly felt.

The present mode of manufacturing Turret Clocks, with the Escapement in general use, prevents a possibility of a short fall for the weights, with extended cylinders.

To gain power without increasing friction, has been the study of all judicious clock-makers. This object cannot be obtained but in two ways, viz. Increasing the diameter of the barrel, or enlarging the size of the pinions. In either case, where a great fall for the weights is required, small cylinders must be used to make the clock go to the time required.

## SECTION III.

ON THE ESCAPEMENT—ITS PROPERTIES, AND THE DIFFERENT PARTS THAT FORM ITS CONSTRUCTION.

The Escapement of this Turret Clock is perfectly rectilinear; all its component parts being made to act at right angles. It consists of two wheels, three inches in diameter, and of equal dimensions, fixed on the 'scape pinion, and separated from each other by a metal collet, to which they are screwed, and their distance asunder is five inches. There are thirty teeth in each wheel, placed so as to intersect each other, and these are bevelled on one side, to deliver in a right line. The pallets are made of agate, and inserted in a counterpoise formed of metal, so as to act alternately at their proper distances with each 'scape wheel down an inclined plane, shaped on the agates. This counterpoise or balance is fixed or screwed to an axis, near its centre, that has two conical pivots that act in followers, which are screwed to the suspension bars affixed to the frame of the clock. At the back of each follower are agates, against which the conical points of the pivots operate; the right hand point bearing the whole pressure. At one end of the axis is

screwed a metal crutch fourteen inches in length, which is balanced by the counterpoise.

The impetus or pressure attending the contact of 'scape tooth and pallet, is precisely uniform, and continues so in operation.

The pendulum rod is made of prepared cleft deal ; its length, seven feet, and its vibration forty-two beats in a minute. The weight of bob, sixty pounds.

## SECTION IV.

### ON THE SUSPENSION OF THE PENDULUM.

The pendulum is suspended at the left side of the frame from a block of iron, technically called a cock, fixed to the cross bar of the clock. It has been asserted by many who have written on the subject, that Turret Clock pendulums should be suspended, independent of the frame, against a firm block of stone or wood.

In this particular, the author, with much diffidence, begs to state here his reasons why he differs from this general opinion. If the cross beams, on which the clock is permanently fixed, should in the least give way or shrink,



(which they are very likely to do in towers and steeples,) the clock must vary in its rate, as a necessary consequence of the pendulum being deranged in its position. But if suspended on the frame of the clock, in case any alteration takes place in the beams, the clock and pendulum are moved together, and the arc of vibration must remain uniform and unaltered.\*

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## SECTION V.

### ON THE UNDULATION OF THE PENDULUM.

To avoid undulation in a pendulum is a matter of some difficulty, and as the admeasurement of accurate time depends on a steady and undeviating oscillation, a plan has been contrived by the author to obviate that difficulty. Suppose the crutch of the pendulum to be fourteen inches from its suspension ; at that distance insert a brass frame into the wooden rod ; in the centre of which let a friction roller

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\* Very great advantages are derived from the pendulum of a Turret Clock swinging at the side of the frame. This idea was suggested by Captain Kater, for which the author takes this opportunity of expressing his most grateful acknowledgments.

be made to act ; round this friction roller let the fork of the crutch traverse.

When in action, its operation is at right angles, so that the impulse received by the pendulum is always in the centre of the roller, and the impact gives a steady and correct oscillation.

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## SECTION VI.

THE COMBINED EFFECT OF THE FIVE FOLLOWING PROPERTIES TRANSMITS THE PROPELLING FORCE EQUALLY THROUGH THE TRAIN TO THE PENDULUM.

1st. The pressure of the whole train is against a point, the smallest space that can be acted on.

2nd. The impact on the pallet is so light, from the small propelling weight required, that the attrition, comparatively speaking, is next to nothing.

3rd. The Escapement acting at right angles, admits of loading the axis with a dense weight, (the counterpoise,) which neutralizes the crutch, and divests it of re-action.

4th. The weight of the counterpoise (one pound and quarter) being equally distributed

round the centre of action, the centre of gravity lies in the centre of the axis, there being no preponderating power on any point of the circle.

5th. As the centre of gravity lies in the centre of the axis, a few grains will put the counterpoise in motion, which is susceptible of the most accurate adjustment.

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## SECTION VII.

### THE DESCRIPTION OF THE TURRET CLOCK CONCLUDED.

This extraordinary reduction of friction and percussion in a Turret Clock would be scarcely credible, were it not capable of being satisfactorily confirmed and substantiated by ocular demonstration.

A Turret Clock of the same size, with a twelve-inch barrel and month train, would take three cwt. as a propeller.\*

The Clock now submitted to public inspection requires only a weight of forty pounds, by which a more than sufficient power is created

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\* If the fall for the weight is to be only twenty-four feet, with a double line.



for the due performance of the various movements, such as unlocking the striking-work, friction of motion-work, and resistance of the hands against the weather, &c. But when the movement is divested of that great mass of resistance, a twelve pound weight puts the month train of wheels into action: and, however incredible it may appear, a two-ounce additional weight keeps the clock in motion,\* whose frame is three feet in length, one foot six inches in width, and two feet in height.

If the size of this Turret Clock is contemplated, its approximation must be acknowledged to be closer to a self-moving power than any machine hitherto constructed.

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## SECTION VIII.

ON THE REMONTOUR ACTION—ITS PROPERTIES AND EFFECTS WHEN APPLIED TO AN ASTRONOMICAL CLOCK.

As it must be well understood from the subject already dilated on, that the principal object of this Escapement is to transmit through

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\* Vibrating an arc of six inches, with a pendulum of seven feet.

the train of the clock an equal impetus to the pendulum, and having shown by what means it has been partially obtained in Turret Clocks, it becomes necessary to describe the means by which the Sidereal Clock has been brought to that degree of perfection which is not altogether requisite in large clocks; for the Turret and Steeple Clock, from exposure and situation, cannot be made to measure time with that degree of accuracy that time-keepers require for astronomical purposes.

The Rectangular Escapement in the Turret Clock differs in no respect from the Sidereal one, with the exception of the size of the wheels and the weight of the counterpoise.

Instead of the ponderous weight used as a balance to the crutch of the Turret Clock, a remontour action has been invented for the Sidereal Clock, fixed at one end of the axis or arbor of the Escapement.

Its action, shape, and the experiments employed to ascertain its efficacy, are subjoined.

The Remontour, or auxiliary spring, is circular, and drawn taper, inwardly, to render the coils capable of opening and shutting with accuracy, and to cause a uniform resistance, for the purpose of making the pendulum isochronic in its vibration.

In its action it is similar to the balance spring of the Chronometer, and is wound up each vibration without friction.

The power of this resisting spring over the train of wheels will appear from the following experiment.

When the clock was got nearly to time, its daily rate might be about five-tenths of a second slow; the propelling weight, three pounds; the range of vibration, two inches and half; and the weight of the pendulum bob, fourteen pounds.

When the circular spring was fixed to its collet on the axis, (using the same power,) its range of vibration increased three-tenths of an inch, and its rate was accelerated two seconds per hour. To gain the arc of vibration required, (three inches and half,) a six pound weight was suspended, which increased its oscillations to that standard.

It must be self-evident, that, by this contrivance, the train is neutralized, and the pressure removed from the weight to the resisting spring, and thence to the pendulum. Thus the great object so anxiously desired, and so long and eagerly sought after is obtained, namely, *the transmitting of the propelling power equally through the train to the pendulum.*



## SECTION IX.

## REFERENCE TO THE COPPER-PLATE FRONTIS-PIECE ENGRAVING.

It exhibits the Astronomical Clock, and diagrams of detached parts, showing the difference between the Escapement deposited with the Society of Arts, London, and the great improvement undergone since the suggestion of Captain Kater.

No. 1.—Side view of the Escapement in the frame of Clock.

No. 2.—The Escapement, as in the model furnished to the Society of Arts.

No. 3.—The Escapement in its improved and perfect state, with the metal counterpoise (A), and agate pallets (B) inserted.

No. 4.—The axis or arbor with the counterpoise in the centre ; at one end of which the crutch (c) is fixed ; at the other, the remontour or pendulum spring (D) is pinned to a collet that is screwed to the arbor. The suspension bars (F) are fixed to the frame of the clock, on which are screwed followers with holes for the pivots to act in. At the back of the followers are inserted in brass, flat pieces of agate, against which the conical points of the axis

operate or press. To the right hand suspension bar (G), a brass cock (H) is screwed, that has a stud with a slit made in it for the remounting spring to slide backwards and forwards in, and when the clock is got in beat, the spring is secured. This spring is wound up at each vibration.

No. 5.—The suspension bar for the pendulum of the Astronomical Clock, fixed at the side of the frame, on a brass plate.\*

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\* This brass plate is instead of a wooden seat-board.

THE END.





























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